

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
3 March 2005 (03.03.2005)

PCT

(10) International Publication Number
WO 2005/019800 A3

- (51) International Patent Classification⁷: **A61B 6/00**
- (21) International Application Number:
PCT/US2004/026759
- (22) International Filing Date: 19 August 2004 (19.08.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/496,316 19 August 2003 (19.08.2003) US
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report:
22 December 2005
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: METHOD FOR FLUORESCENCE LIFETIME IMAGING MICROSCOPY AND SPECTROSCOPY

(57) Abstract: A method and system for analysis of fluorescence emission spectroscopy data and fluorescence lifetime imaging microscopy data are described. A unique Laguerre expansion can be found for fluorescence intensity decays of arbitrary form with convergence to a correct solution faster than with conventional methods. The Laguerre expansion technique includes expansion coefficients highly correlated with intrinsic fluorescence lifetimes, allowing direct characterization of fluorescence dynamics. For complex systems, conventional analysis of fluorescence intensity decay in terms of discrete exponential components can not readily provide a true representation of underlying fluorescence dynamics. Utilizing the Laguerre expansion technique, an alternative non-parametric method for analysis of time-resolved fluorescence data from various systems is described, facilitating characterization and discrimination of a sample. An ultra-fast method for analysis of fluorescence lifetime imaging is also described, facilitating real-time analysis of compositional and functional changes in samples, at a microscopic or macroscopic level.



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